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Suburban Rail in the Podkarpackie Voivodeship as a Factor Stimulating the Development in the Region

Abstract: Over the last few years, there has been a clear increase in interest in rail transport among local authorities, especially the agglomeration rail. A particular emphasis in this respect is being observed in large agglomerations and the surrounding suburban areas, where transport problems are becoming increasingly frequent. The fact that the number of passengers of agglomeration and regional railways in Poland is growing gives a positive overtone to the issue in question. The project of creating a system of Suburban Rail in the Podkarpackie Voivodeship is to significantly affect the development of the region. A reduction in commute time, the improvement of the transport offer and the increase in the accessibility to rail transport in Rzeszów area and thus the improvement of mobility of the society are some of the advantages of the investment. The project will encompass municipalities located within railway lines running from Dębica to Przeworsk and from Kolbuszowa to Strzyżów. The aim of the article is to present general assumptions of the project and to estimate the benefits resulting from the project for the region and its inhabitants. The research methodology and data sources consist mainly of an analysis of the documents concerning the Feasibility Study for the project The Construction of Suburban Rail obtained from the Marshal's Office in Rzeszów, with particular emphasis on Stage II - A marketing analysis of investment variants and Stage III - A technical analysis of all investment variants of the project together with cost estimation. The basis of the study also included research of the subject literature and interviews with the people responsible for project implementation.

Keywords: Suburban Rail; regional development; railway transport; Podkarpackie voivodeship

Introduction

Transport is one of the most important factors determining the economic development of the country and the region. An efficient transport system is conducive to social and economic development. Inefficient and neglected - when there is poor infrastructure - limits the socio-economic development [Toruński J., 2009, p. 23]. The immediate task of the city's transport system is to provide residents with spatial accessibility, i.e. the possibility of using various facilities and institutions that enable the implementation of human life, which are located in the space of the metropolis [Kozłak A., 2013, s. 173].

The dynamic development of metropolitan areas in Poland, and therefore also the suburban areas and communes belonging to them, poses an increasing challenge in terms of public transport services. The phenomenon of urbanization was and is still accompanied, above all, by the rapid surface growth of cities - the construction of new housing estates, but also the uncontrolled growth of suburban zones caused by the fashion for a house near the city. The *urban sprawl* phenomenon led to the emergence of more housing estates by developers, tempted by lower land prices, individual single-family houses, as well as the expansion of satellite cities offering a higher quality of living - larger apartments and houses,

greenery, lower maintenance costs. Along with this trend, however, also problems with transport. A house or a flat near the city usually requires at least one car. Inhabitants of suburban zones, as well as the surrounding villages and towns, usually still work in one large city. The road and parking system of major urban centers is most often unable to accommodate increased car traffic, which entails all the negative phenomena related to congestion in road traffic: increased air pollution or extended travel times [Raczyńska-Buława E., 2015, s. 38].

In the era of widespread congestion, the greatest hopes are therefore associated with wider use of rail transport - trams in urban transport and rail transport in servicing suburban areas and located in municipalities adjacent to the metropolis [Kozłak A., 2013, pp. 177-178]. A well-functioning railway system around a metropolis seems to be the best way to increase the mobility of the inhabitants of this area.

Statistics conducted by the Office of Rail Transport show that passenger rail companies, which provide transport only in the area of urban agglomerations, as well as nearby smaller cities, located within the distance acceptable for a passenger for daily commuting, are gaining an increasing share in the number of transported passengers. The popularity of agglomeration rail systems is an opportunity to solve many pressing problems of large cities related to their excessive spillage or the negative effects of congestion on the roads. [Raczyńska-Buława E., 2015, s. 37].

The main purpose of the study is to present the general assumptions of the project and to estimate the benefits of the project for the region and its inhabitants. Moreover, emphasizing that an efficient transport system is a significant factor stimulating the development of the region and that there is a gradual change in the prioritization of the transport network, which stimulates the interest of passengers in changing communication behavior. The research methodology and data sources mainly include analysis of documents concerning the Feasibility Study for the project "Construction of the Suburban Agglomeration Railway", obtained from the Marshal's Office, with particular emphasis on Stage II - Marketing analysis of investment variants and Stage III - Technical analysis of all investment variants project together with the cost estimation. The study was also based on literature studies on the subject and interviews with persons responsible for the implementation of the project.

Agglomeration railway and its advantages

There are four subsystems in passenger rail transport, i.e. inter-agglomeration, interregional, regional, and agglomeration transport. Regional and agglomeration transport is used to service metropolitan areas, however, agglomeration railways, which focus on urbanized areas, have much greater development potential. Agglomeration transport provides a convenient and fast connection between suburbs and satellite cities with agglomeration centers. They enable the movement of large streams of travelers in an efficient and safe manner [Kozłak A., 2013, s. 178].

In the world, urban or agglomeration rail systems function in various systems: diametrical, radial, circumferential, or as a combination thereof. It is impossible to state unequivocally which of the mentioned models is the most advantageous, because with different local conditions, sometimes different systems allow achieving the best results [Makuch J., 2018, p. 23]. The oldest S-Bahn systems in Berlin still remember the first half of the 19th century. In the 1960s, as was the RER in Paris (construction started in the 1960s). With the growth of cities in the second half of the In the 1980s and at the beginning of the 21st century, subsequent German, Swedish, British, Austrian, Swiss and other cities launched agglomeration rail systems.

The definition of agglomeration (or suburban) railways is difficult to define. In Poland, these transports are often equated with more regional transport - for example for economic reasons. The definitions existing in legal acts are also imprecise. In the study of the European Rail Research Advisory Council, commuter/agglomeration railways cover a journey of a maximum length of 15 km and 30 minutes of the journey. In the Directive of the European Parliament and the EU Council - these are transport services whose main purpose is to meet the transport needs of an urban center or conurbation, including a cross-border conurbation, as well as transport needs on the route between the urban center or conurbation and the surrounding areas. The Railway Transport Office, on the other hand, states that agglomeration and suburban transport "are aimed at meeting the transport needs of a large urban center/conurbation / metropolitan area, as well as transport needs between such a center and adjacent areas" [Directive of the European Parliament and of the Council ..., 2012, s. 32-77].

Agglomeration railways, due to their purpose, serve primarily people living in the areas adjacent to the agglomeration, commuting to work in a larger urban center, and meet the transport needs within the agglomeration, serving as a fast and reliable means of transport, independent of traffic congestion and above all, faster than a car or a bus. Connections of agglomeration railways are strongly connected with the public transport network and enable a quick and effective change of the means of transport [Raczyńska-Buława E., 2015, s. 38]. The main reason for the success of agglomeration transport was their integration with public transport in cities, which takes place on various levels: technical - construction of integrated transfer nodes, visual and electronic information systems, organizational - common ticket systems, route reconciliation, coordination of timetables, etc., commercial - a joint distribution of services (information, commercial clearance). The integrating function of various means of public transport should be performed by railway stations in large agglomerations, depending on local conditions - the location of stations and the layout of the public transport network and road roads [Biała Księga. Map of Polish Railways Problems, 2009, p. 45]. In the area of looser suburban buildings, surrounding smaller urban centers and housing estates, it is often also possible to conveniently reach the station by car or bicycle and safely leave them at the station/railway stop (Park & Ride system) [Raczyńska-Buława E., 2015, s. 38].

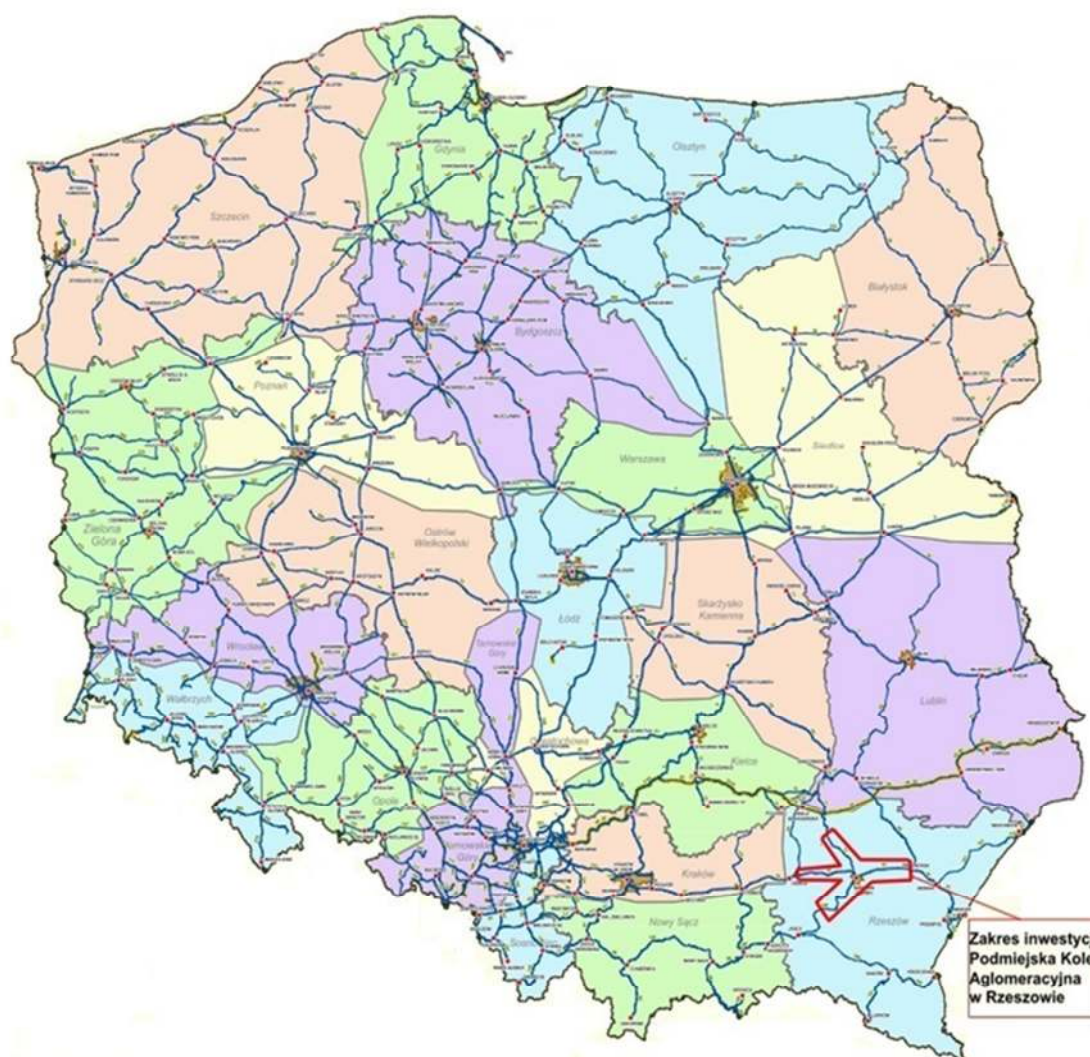
Agglomeration railways are still a new topic in Poland, but it is worth noting that the number of travelers using rail services is growing because passenger car traffic is hindered on the roads by numerous traffic jams, which discourages the owners of these vehicles from driving daily within the agglomeration, and this makes rail transport attractive. The network of railway connections is being expanded, modern rolling stock is put into operation, the frequency of trains is increasing. The increase in demand for agglomeration journeys is influenced by the improvement of the image of railways, mainly due to the success of the interregional travel offer by high-speed trains [Toruński J., 2009, s. 30].

Moreover, the advantages of the agglomeration railway include: short travel time, including the possibility to use travel time for work or rest; high frequency of trains, especially in regional and agglomeration traffic; door-to-door transport, i.e. good communication with other trains and cooperation with other means of transport; travel cost adequate to the quality offered and the customer's capabilities; availability of information through new media, such as: Internet, electronic carriers, free helplines; the sound system inside the vehicle, which is used not only to transmit messages about subsequent stops, stations and possibly further connections, but also to transmit other information [Toruński J., 2009, s. 31].

Suburban agglomeration railway in the Podkarpackie Voivodeship - assumptions and description of the project

In order to improve the transport accessibility of the Rzeszów agglomeration and meet the transport needs of its inhabitants, a project was developed to build a suburban agglomeration railway. The implementation of the activities was preceded by preliminary consultations that were carried out with local government units, carriers and other stakeholders of the project [Feasibility study for the project: Construction of the Suburban Agglomeration Railway - PKA, 2017, p. 26].

The planned investment is located in the Podkarpackie Voivodeship, in the following counties: Dębicki, Rzeszów, Łańcut, Przeworski, Kolbuszowski and Strzyżów, and is an example of a solution that is increasingly used in Poland. The scope and location of investments against the background of the country are shown in Figure 1.



1. Location of the project on the map of Poland

Source: Feasibility study for the project: Construction of the Suburban Agglomeration Railway - PKA "

The project will cover communes located within the railway lines running from Dębica to Przeworsk and from Kolbuszowa to Strzyżów. In these communes, the infrastructure around the stop and access to railway stations and stations will be developed. The investment concerns a linear project for the construction of new passing tracks and the

construction of the track to the Rzeszów-Jasionka Airport and includes many point elements for the reconstruction or construction of stop infrastructure [Feasibility study for the project: Construction of the Suburban Agglomeration Railway - PKA, 2017, p. 22].

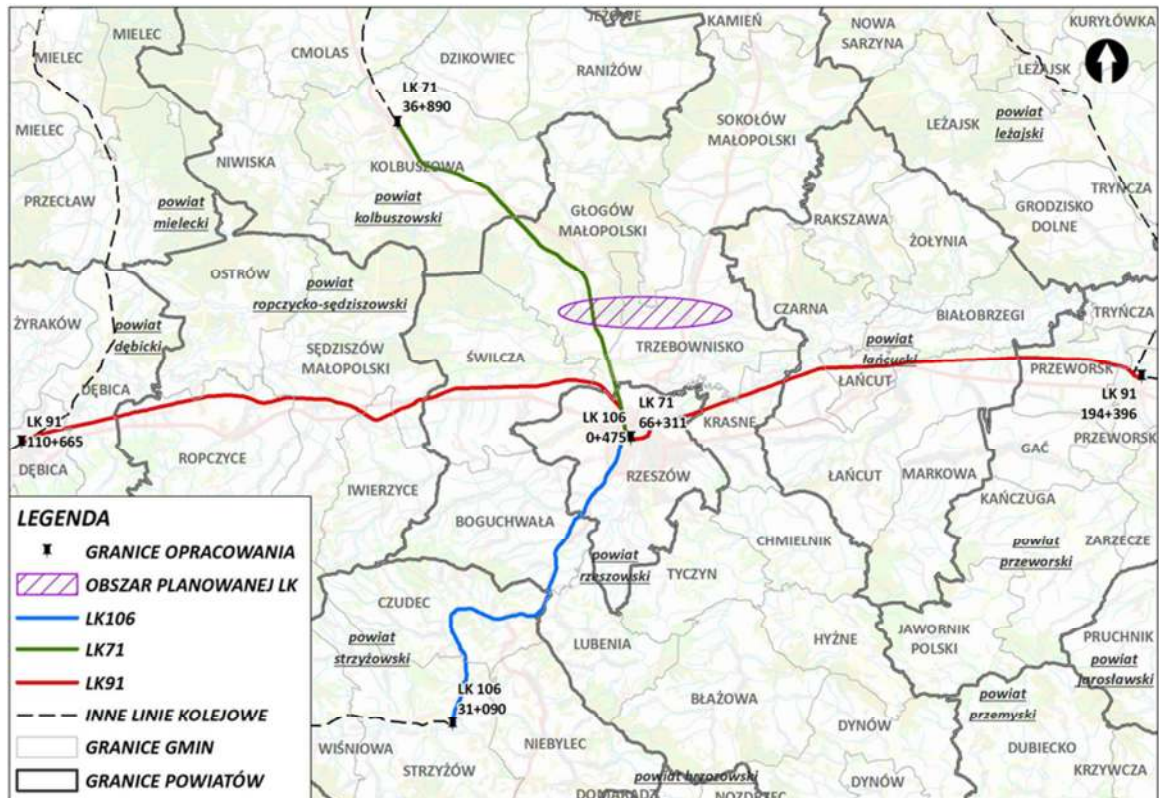
Several investment options were developed for the project, along with passenger traffic forecasts until 2050. The first is a non-investment variant - the so-called variant "0". The non-investment scenario assumes, as a rule, maintaining the current technical parameters of the stop railway infrastructure in a non-deteriorated condition throughout the entire life cycle of the project, which translates into the entire period of analysis performed for the project (reference period). In a situation when the necessary expenses for the maintenance of certain railway lines or another element of the railway infrastructure would increase significantly and at the same time there would be no coverage in the infrastructure manager's maintenance budget, the assumption was made to incur maintenance expenses at an unchanged level for a certain period with the simultaneous occurrence of the resulting gradual deterioration. the technical condition of the infrastructure deteriorates, which will lead to a decline in the operational parameters of the infrastructure, mainly speed and capacity. A variant was considered which assumes that in the framework of Przewozy Regionalne Sp. z o.o. agglomeration traffic will be carried out with the use of currently existing railway stops. It is assumed to maintain the transport performance at a similar level as in the previous years and to maintain the frequency of railway transport at the current level. The variant assumes incurring maintenance expenses similar to the current level and lowering the technical parameters of the infrastructure. Variant "0" will serve as a reference variant in the analyzes prepared as part of the Feasibility Study [Feasibility study for the project: Construction of the Suburban Agglomeration Railway - PKA, 2017, p. 28].

Two non-investment variants were also adopted, adopted separately for the scope of the project related to the purchase of rolling stock, including the construction of technical facilities, and for the scope of the infrastructure project. For the scope related to the purchase of rolling stock, including the construction of technical facilities, variant "0" includes the electrification of the railway line No. 71, the modernization of the railway line No. 91 in the section under analysis, the revitalization of the railway line No. 106, the modernization of the Rzeszów station and other projects with the expected completion date is until 2021. For the scope of the infrastructure project, the non-investment variant does not take into account the construction of the infrastructure provided for in this project (it takes into account the infrastructure built by 2021 in other projects), but takes into account train traffic related to the launch of PKA - the number of PKA trains in the non-investment infrastructure and investment variant is variable and assumes implementation of PKA in 2 phases - from 2021. entirely on line 91 and partly on 71 and 106, and from 2023. in full size on lines 106, 71, and the airport. In the non-investment infrastructure variant, the number of PKA trains depends on the capacity of a particular line. This variant assumes the number of PKA trains that can run in the current capacity. The remaining trains are included in the investment variant [Feasibility study for the project: Construction of the Suburban Agglomeration Railway - PKA, 2017, p. 28].

In variant 1 - investment - it was assumed that the full version of the PKA is being developed. New stops are built, the existing ones are rebuilt and adapted to the current and future transport needs. A railway line to the Rzeszów-Jasionka Airport is under construction. Technical facilities for technical service and ongoing maintenance of the rolling stock are being built at the Rzeszów Staroniwa station. Park and ride parking lots integrated with other types of transport are being built around the stops. New access roads to stops, new pavements, and access to platforms are built. New rolling stock is purchased for PKA's needs. PKA operates under the formula of operation of an operator selected in a tender.

Variant 2, however, differs from variant 1 in the way PKA functions. Organizationally, PKA operates as an independent limited liability company owned by the Podkarpackie Voivodeship and local government units. It should be noted that, in addition to the above administrative and legal variants of PKA functioning, the Contractor defined two technical sub-variants (PWT1 and PWT2).

The PKA communication network is polycentric around Rzeszów. Both the rail network and the road network are situated in the same communication corridors. Figure 2 shows the exact layout of the PKA with the color marking of individual sections along with an indication of the area of the planned line to the airport [Feasibility study for the project: Construction of the Suburban Agglomeration Railway - PKA, 2017, p. 32].



2. The geographical scope of the analyzed sections of lines No. 71, 91, 106 and the railway line to the Rzeszów-Jasionka Airport on the background of the Podkarpackie Voivodeship
 Source: Feasibility study for the project: Construction of the Suburban Agglomeration Railway - PKA "

Table 1 shows the target average distances covered in transport corridors after the launch of the PKA.

Tab. 1. Distances in individual PKA transport corridors

Transport corridor	Average distance covered on the route
Dębica-Rzeszów	32 km
Rzeszów-Przeworsk	22 km
Kolbuszowa-Głogów Młp.	13 km
Głogów Młp.-Rzeszów	10 km
Rzeszów-Strzyżów	17 km

Source: own study based on data from the Feasibility Study for the project: Construction of the Suburban Agglomeration Railway - PKA "

Complementary elements of the system will be Park & Ride car parks in designated locations for passenger cars and bicycles, shuttle transport (city or suburban buses running to/from railway lines) to PKA trains, financed by county cities and additionally performing a city-forming function for given centers, a shared ticket (zone tickets including PKA trains and public transport), ultimately also regional bus transport, integrated real-time passenger information covering all elements of the travel chain (train + bus) in terms of timetables, their tabular version, tariffs and rights passenger [Feasibility study for the project: Construction of the Suburban Agglomeration Railway - PKA, 2017, p. 70].

A SWOT analysis was also developed for the investment (table 2).

Tab. 2. SWOT analysis for PKA

Strengths	Weaknesses
<ul style="list-style-type: none"> • increasing the capacity of the analyzed railway lines, • improving access, • accessibility of rail transport, with particular emphasis on people with reduced mobility, • reducing the negative impact on the environment by taking over passenger traffic by rail transport from road transport, • increasing the frequency of passenger travel by rail by making the transport offer more attractive, • shortening the travel time to the airport compared to the existing situation. • improvement of safety and elimination of operational hazards at railway crossings. 	<ul style="list-style-type: none"> • high investment outlays for the construction of new railway lines and stops on existing lines, • high costs of purchasing modern rolling stock, • still bad image of rail transport and low level of personal safety of travelers • limited door-to-door transportation options.
Opportunities	Threats
<ul style="list-style-type: none"> • EU policy promoting sustainable transport development, • modernization and replacement of rolling stock increasing the quality of services provided, • progressing transport congestion in cities, reducing the competitiveness of other means of transport, • taking actions to integrate rail transport with the urban and individual transport system (Park & Ride, Bike & Ride), • the tendency to include rail transport in airport services. 	<ul style="list-style-type: none"> • insufficient demand, lower than forecast, • investments improving the condition of road infrastructure in agglomerations, • strong attachment of part of the society to driving by car.

Source: own study based on data from the Feasibility Study for the project: Construction of the Suburban Agglomeration Railway - PKA "

It is worth mentioning that the project will use modern technological solutions, including Dynamic Passenger Information System (SDIP), the components of which are: an information display system, and a broadcasting system, as well as a Video Monitoring System (SMW). Both the design and the technology used will significantly change the landscape of the areas as well as the everyday life and behavior of people in the space of the planned investment. The project is to be completed in 2022 [Feasibility study for the project: Construction of the Suburban Agglomeration Railway - PKA, 2017, pp. 28-72].

Summary

Transport accessibility of suburban areas and municipalities belonging to metropolitan areas will significantly improve when they are connected to the metropolitan core by agglomeration rail. The agglomeration railway plays an important role as a factor stimulating the socio-economic development of the region, it is also important for the cultural and intellectual development of the society. The development of rail connections and rail infrastructure along with urban transport are also intensively supported strategically and financially by the EU transport policy, which focuses on reducing greenhouse gas emissions as well as the negative effects of road congestion while increasing the quality of life in cities, revitalizing their centers and limiting their spillage. to the areas around cities [Raczyńska-Buława E., 2015, pp. 38-39].

The project of creating the Suburban Agglomeration Railway system in the Podkarpackie Voivodeship is an important factor stimulating the development of the region. The agglomeration railway will allow shortening the travel time, improve the transport offer and increase the accessibility to rail transport in the Rzeszów agglomeration, and thus improve the mobility of the society. In addition, reducing the volume of road transport in favor of rail transport will neutralize the negative impact of transport on the natural environment. The advantages of the project are also worth including [Feasibility study for the project: Construction of the Suburban Agglomeration Railway - PKA, 2017, p. 22]:

- direct connection of the city center with the Rzeszów-Jasionka airport,
- integrating the project with public transport and shuttle transport,
- providing residents with spatial accessibility, i.e. the possibility of using various facilities and institutions that enable the implementation of human life activity,
- increasing the capacity of the analyzed railway lines, improving the accessibility of rail transport, with particular emphasis on people with reduced mobility,
- reducing social and economic differences between citizens of the European Union.

The above factors allow for a positive assessment of the implementation of the suburban agglomeration railway plan in the Podkarpackie Voivodeship. In the future, the investment will contribute to reducing excessive traffic on roads, changing the existing transport habits of the society and improving the condition of the natural environment in the region.

Source materials

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